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IS 12649 (1989): Treated/coated Fabrics for Various Applications - Guide for Selection [PCD 13: Rubber and Rubber Products]



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*Indian Standard*

**TREATED/COATED FABRICS  
FOR VARIOUS APPLICATIONS —  
GUIDE FOR SELECTION**

“पुनर्विचार १९९५”  
“RE-AFFIRMED 1995”

**भारतीय मानक**

**विभिन्न प्रयोगों के लिये उपचारित/लेपित वस्त्र चयन की मार्गदर्शिका**

UDC 677·077·65

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards on 6 March 1989, after the draft finalized by the Treated Fabrics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

At present, coated/treated fabrics with coating based on wax, rubber ( natural and synthetic ) and vinyl are predominantly used in India. The other coatings currently used are based on polyethylene and polyurethane. The scope and range of coated fabrics are increasing with the development of new products. Invariably, the main objective is to achieve lower mass per unit area of the finished fabric through the use of light weight fabrics ( substrates ) and the use of coatings with maximum tensile and tearing strength and ageing properties with improved performance.

In the information covered in this standard, an attempt has been made to include a large number of possible combinations of substrates with varying construction and different coating which are traditional for a certain end-use or are likely to prove advantageous for such uses in future. In the selection of the substrate and/or the coating, the reason for suggesting certain combinations for specific end-use is based on either the practical experience in India or abroad and on the possibility that they would lead to improve performance for such uses. It is expected that the user of this guide would be able to locate the best possible combination of substrate and coating with desired properties which he has in mind for a particular end-use.

Wherever available, reference to relevant Indian Standards have been made in the respective tables. For further details, these specifications may be consulted.

It is expected that in due course, different combinations of substrate and coating with improved performance are likely to come up which the Committee would take cognizance of on their own merits.

*Indian Standard***TREATED/COATED FABRICS  
FOR VARIOUS APPLICATIONS —  
GUIDE FOR SELECTION****1 SCOPE**

**1.1** This standard provides guidelines for the selection of right combination of substrate and coating which is desirable for a coated/treated fabric for the specific end-use envisaged. It also recommends preferred characteristics of the substrate and coating for specific applications.

**2 REFERENCES**

**2.1** The Indian Standards listed in Annex A are necessary adjuncts to this standard.

**3 TYPICAL END-USE OF TREATED/  
COATED FABRICS AND SELECTION  
CRITERIA**

**3.1** A list of various base fabrics which are commonly used as substrates for coated/treated

fabrics along with their inherent properties is given in Annex B.

**3.2** A list of various coating materials commonly used for coated/treated fabrics along with their inherent properties is given in Annex C.

**3.3** A list of base fabric and coating materials prescribed in various published Indian Standard Specifications on coated/treated fabrics along with some basic parameters and specific end-uses is given in Annex D.

**3.4** With particular end-use in view, a list of substrates and types of coating with limiting mass per unit area and essential performance tests are given in Table 1. This table is intended to be used as a guide in selecting the combinations of right substrates and coatings with specific performance for the intended applications.

**Table 1 Typical End-uses of Treated/Coated Fabrics and Their Selection Criteria**  
( Clause 3.4 )

Sl No.	End-use	Substrate ( Base Fabric )	Type of Coating ( Proofing Chemical )	Limiting Mass Per Unit Area ( g/m <sup>2</sup> )	Recommended Essential Performance Test	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Fumigation covers	Type A Cotton  Type B HDPE/PP woven fabric  Type C Nil Nylon woven fabric	Natural rubber Synthetic rubber  LDPE  PVC film PVC	200 to 650	i) Fumigan retention properties ii) Adequate tear resistance iii) Light weight	Double texture rubberized fabric Type B and C Promising result obtained in developmental samples
ii)	Water resistant fabrics	Cotton woven Cotton knitted Nylon Polyester cotton Glass Polyester Rayon Jute Polypropylene	Natural rubber Vinyl (PVC) Polychloroprene Isobutylene isoprene Acrylic Silicone Polyurethane EPDM Viton Chlorosulphonated polyethylene (CSM)	65 to 400	Water proofness	Main Applications Lining of garments and stores ( Cloth cotton rubberized ) Ground sheets Hospital sheeting Tent flooring Silos
iii)	Tarpaulins	Cotton Nylon Polyester-cotton Polyester HDPE/PP Jute	Chemicals, wax Polychloroprene Polyethylene PVC EPDM	150 to 450	Water repellency or Water proofness as applicable Tear resistance	The conventional chemically proofed canvas is finding competition from i) HDPE woven fabric coated with LDPE due to lower cost, and ii) Polychloroprene coated nylon polyester-cotton fabric in sophisticated uses where valuable stores (say, on ship deck) have to be protected
iv)	Upholstery materials	Cotton woven Cotton knitted Rayon Blended fabrics Nylon Jute Polyester	PVC PVC poromeric Polyurethane	200 to 700	Abrasion and tear resistance Flexibility and retention of flexibility under condition of stress and hot/cold climate Flame retardance	
v)	Materials for footwear	Cotton woven Cotton knitted Rayon Blended fabrics Nylon Polyester	Natural rubber PVC Polyurethane	400 to 1 300	Flexibility Water proofness	
vi)	Chemically resistant material	Cotton woven Cotton knitted Nylon Polyester-cotton	Natural rubber Polychloroprene Isobutylene isoprene Nitrile EPDM Viton Chlorosulphonated polyethylene (CSM)	200 to 500	Resistance to specific chemicals, such as, acids, alkalis, petroleum products and chemicals likely to come in contact in actual use	

Table 1 ( concluded )

Sl No.	End-use	Substrate ( Base Fabric )	Type of Coating ( Proofing Chemical )	Limiting Mass Per Unit Area ( g/m <sup>2</sup> )	Recommended Essential Performance Test	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
vii)	Radiation proof fabrics	Cotton Nylon Polyester-cotton	Natural rubber Polychloroprene Nitrile EPDM Viton Chlorosulphonated polyethylene	450 to 1 100	Resistance against various radiation hazards met by i) Medical workers, and ii) Workers in nuclear installation, etc	
viii)	Fire-resistant fabrics	Cotton Nylon Polyester-cotton Glass Polyester Jute	PVC Polychloroprene Polyurethane Chlorobutyl Bromobutyl	300 to 1 100	Fire retardance Water proofness Rot proofness	
ix)	Floatation equipment	Nylon woven Nylon knitted Polyester woven Polyester knitted	Polychloroprene Isobutylene isoprene Natural rubber PVC Polyurethane Chlorosulphonated polyethylene	250 to 1 500	Air proofness Water proofness Weathering (ozone) resistance	KK 600 and 200 for floats, buoys and naval applications
x)	Mountaineering equipment	Cotton Nylon Polyester-cotton	Natural rubber Polychloroprene Isobutylene isoprene Polyurethane	60 to 200	Lightness in weight Reasonable abrasion resistance Adequate colour brightness Resistance to weathering (ozone) and ultraviolet rays	Main application: a) Sleeping bags b) Rucksack, and c) Light weight tents
xi)	Rot-resistant fabric	Jute	Chemicals	1 to 2 percent add-on on the mass of the fabric	Rot-resistance properties	Used for jute netting for erosion control sand bags, etc

## NOTES

1 The lower range is normally applicable in case of items with synthetic substrates having high strength, smooth finish and low coating. The higher range is normally applicable in case of coarse fabrics requiring substantial amount of coatings.

2 Wherever polyurethane coating is used, the limiting mass can be substantially less than the lower limit indicated.



**ANNEX A**( *Clause 2.1* )**LIST OF REFERRED INDIAN STANDARDS**

<i>IS No.</i>	<i>Title</i>
IS 1001 : 1956	Specification for fuel pump diaphragm fabric (a) synthetic rubber proofed (b) varnish proofed
IS 1259 : 1984	Specification for vinyl coated fabrics ( <i>third revision</i> )
IS 2089 : 1977	Specification for common proofed canvas/duck and paulins ( tarpaulins ) ( <i>second revision</i> )
IS 2427 : 1968	Grading of continuous filament viscose rayon yarn and acetate yarn, bright and dull ( <i>first revision</i> )
IS 2789 : 1972	Specification for special proofed paulins ( tarpaulins ) ( <i>first revision</i> )
IS 3322 (Part 1): 1987	Specification for water-resistant clothing : Part 1 PVC-Coated fabrics ( <i>first revision</i> )
IS 3768 : 1966	Specification for PVC-Ventilation tubing ( flexible ducting )
IS 4355 : 1977	Specification for fire resistant brattice cloth ( <i>first revision</i> )
IS 4588 : 1986	Specification for rubber, raw, natural ( <i>third revision</i> )
IS 4810 : 1968	Specification for fumigation sheets and covers, rubberized
IS 5188 : 1985	Specification for cold polymerized oil-extended raw styrene-butadiene rubber ( <i>first revision</i> )
IS 5189 : 1986	Specification for cold polymerized raw styrene-butadiene rubber ( <i>first revision</i> )
IS 5915 : 1970	Specification for single texture rubberized water proof fabrics
IS 6110 : 1983	Specification for double-texture rubberized waterproof fabrics ( <i>first revision</i> )
IS 7867 : 1975	Specification for continuous filament textile polyamide ( nylon ) yarn
IS 8698 : 1984	Specification for expanded vinyl coated fabrics ( <i>first revision</i> )
IS 8699 : 1977	Specification for PVC coated fabrics for footwear industry
IS 9766 : 1981	Specification for flexible PVC compounds

# ANNEX B

( Clause 3.1 )

## TEXTILE FIBRE COMPARISON CHART

Sl No.	Properties Data on Fibre Properties Obtained From the Fibre Manufacturers	Fibreglass Filament 'E' Glass	Cotton	Viscose Rayon <sup>1)</sup>			Nylon, Nylon Filament <sup>2)</sup>		Polyester		
				Regular	Intermediate Tenacity Filament and Staple	High Tenacity	Regular	High Tenacity			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
i)	Breaking tenacity, g/d	Std 6.0 to 7.3	Amer Upland: 3.0 to 4.9	1.5 to 2.4	2.4 to 3.2	3.0 to 5.0	4.5 to 5.8	6.8 to 8.6	4.7 to 6.0		
		Wet 3.9 to 4.7	Amer Upland: 3.3 to 6.37	0.7 to 1.4	1.2 to 1.9	1.9 to 3.6	4.3 to 5.3	5.4 to 7.5	4.7 to 6.0		
		Std loop 0.9 to 1.1	NA	1.0 to 1.5	1.5 to 2.2	2.3 to 2.5	3.8 to 5.4	7.0	6.8 to 10.0		
		Std knot 1.8 to 2.2	NA	0.7 to 1.4	1.4 to 2.1	2.2 to 2.4	3.8 to 5.3	6.1	4.0 to 5.0		
ii)	Tensile strength, MPa	1 380 to 1 520	300 to 750	200 to 320	320 to 450	450 to 720	500 to 580	750 to 860	810 to 970		
iii)	Extension at break, percent	Std 3.0 to 4.0	3 to 7	15 to 30	15 to 20	9 to 22	24 to 40	16 to 17.5	35 to 50		
		Wet 2.5 to 3.5		20 to 40	17 to 30	14 to 30	28 to 42	19 to 24	35 to 50		
iv)	Elastic recovery, percent	100	74 at 2 percent	30 to 74	97 at 2 percent	70 to 100	100 at 2 percent	100 at 4 percent	90 to 95		
			45 at 5 percent	at 4 percent	at 2 percent	100 at 8 percent					
v)	Average stiffness, g/d	322	57 to 60	11.1	16.6	25.5 to 29	23	48	54 to 77		
vi)	Average toughness	0.07	0.15	0.19	0.21	0.22 to 0.30	0.67	0.75	0.35 to 0.55		
vii)	Relative density	2.54	1.54	1.56 to 1.52			1.14		1.38		
viii)	Water absorbcy, percent	None	7	13 : 11 is commercial standard			4 to 5		0.4		
				a) 21°C, 65 percent relative humidity							
				b) 21°C, 95 percent relative humidity	Up to 0.3 percent (surface)	24 to 27	27		6.5 to 8.5		0.6
				c) 100 percent relative humidity (q water imbibition)							

5

## TEXTILE FIBRE COMPARISON CHART

Sl No.	Properties Data on Fibre Properties Obtained From the Fibre Manufacturers	Fibreglass Filament 'E' Glass	Cotton	Viscose Rayon <sup>1)</sup>			Nylon, Nylon Filament <sup>2)</sup>		Polyster
				Regular	Intermediate Tenacity Filament and Staple	High Tenacity	Regular	High Tenacity	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ix)	Effect of heat	Will not burn, looses up to 50 per cent tensile strength at 370°C. Strength continuous to decline to softening point at 835°C	Highly resistant to degradation. Yellows at 120°C, after 5 h, decomposes at 150°C	Does not melt, losses strength at 150°C. Decomposes at 180 to 200°C	melt, losses strength at 180 to 200°C		Melts between 215 to 250°C. Yellows slightly at 150°C when held for 5 h		Softening point 220 to 240°C and melting point 245 to 260°C
x)	Effect of acid	Resists most acids	Disintegrated by hot dilute acids or cold concentrated acids. Unaffected by cold weak acids	Similar to cotton: hot dilute or cold concentrated disintegrate fibre			Oxidizing agents and mineral acids, such as, hydrochloric and sulphuric cause degradation. Others such as benzoic and oxalic will cause loss in tenacity and elongation depending upon time and concentration		Good in normal use, soluble in hot concentrated acids
xi)	Effect of alkalis	Resists most alkalis	Swelling (mercerization) in caustic but no damage	Strong solution causes swelling and reduces strength			Substantially inert		Generally good but slightly hydrolyzed specially with amines
xii)	Effect of other chemicals	Generally good	Bleached by hypochlorites and peroxides: oxidizes into oxycellulose. Swells and disintegrates in cuprammonium hydroxide	Attacked by strong oxidizing agents, not damaged by hypochlorite or peroxide bleaches			Generally good resistance		Strong resistance

xiii)	Effect of organic solvents	Unaffected	Resistant	Generally insoluble; soluble in cuprammonium and a few complex compounds	Generally insoluble; soluble in some phenolic compounds and in concentrated formic acid	Resistant, soluble in phenols, concentrated alkalis and ethylene glycol
xiv)	Dyes used	Resin bonded pigments. Special technique utilizing protein film applied during manufacture for vat, direct acid and chrome	Direct, vat, azoic, basic, mordant, pigment, sulphur	Same as for cotton; medium and high tenacity are harder to dye	Has a marked affinity for all types of dye-stuffs, including direct acid, premetallized acid, chrome and vat colours as well as the newer complex types. New colour effects may be obtained in cross-dyeing when used in conjunction with other types of nylon	Disperse, azoic and cationic
xv)	Resistance to mildew	Not attacked (binder may be, however)	Poor unless bleached or acetylated	Attacked	Not attacked	Not attacked
xvi)	Identification	Does not burn	Burns rapidly leaves fine grey ash and no bead. Longitudinal appearance is flat and ribbon like with convolutions. Dissolves in 80 percent cold sulphuric acid	Does not melt, burns readily with little ash; insoluble in acetone	Melts before burning, self extinguishing, insoluble in acetone or boiling sodium hydroxide solution; soluble in concentrated formic acid and xlenol. Dissolves slowly in chloral hydrate	Retains its fibre form after boiling for 1 min in 90 percent phosphoric acid. Ignites with difficulty, burns giving off an aromatic odour

1) See IS 2427 : 1968.

2) See IS 7867 : 1975.

NOTE — This table has been reproduced from Owens Corning Fibreglass Fabrics Handbook 1964. Values for polyester fibre have been taken from Textile World Manmade Fibre Chart 1986 and Paper of Shri C. Bhattacharya ( IPCL ) published in Man Made Fibres International, 1981, Vol. 1.

## ANNEX C

( Clause 3.2 )

## SOME IMPORTANT PHYSICAL PROPERTIES OF RUBBER AND PVC

SI No.	Properties	Nitrile Rubber	SBR <sup>1)</sup> Rubber	Isobutylene Isoprene Rubber	Polychloroprene Rubber	Natural <sup>2)</sup> Rubber	Silicone Rubber	Plasticized PVC	Polyurethane	Chlorosulphonated Polyethylene (CSM)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	Scuff resistance	P	P	GE	GE	P	E	E	E	G
ii)	Weather resistance	F	F	GE	E	F	E	E	E	E
iii)	Heat resistance	G	FG	GE	G	F	E	F <sup>3)</sup> and 4)	F	G
iv)	Chemical resistance	FG	FG	E	FG	FG	GE	E	P	G
v)	Oil resistance	E	P	P	FG	P	PG	GE <sup>5)</sup>	E	G
vi)	Impermeability	G	F	E	G	F	P	E	G	G
vii)	Cold resistance	G	G	G	FG	G	E	G <sup>6)</sup>	G	F
viii)	Tear resistance	FG	FG	G	FG	GE	P	G	E	F
ix)	Abrasion resistance	G	G	FG	G	E	P	E	E	F
x)	Set resistance	GE	G	FG	F	G	GE	F	G	FG
xi)	Dynamic properties	GE	G	F	F	E	P	E	E	G
xii)	Acid resistance	F	F	G	FG	FG	FG	E	P	G
xiii)	Tensile strength	GE	GE	G	G	E	P	GE <sup>3)</sup>	EG	GG
xiv)	Electrical properties	F	G	G	F	G	E	E	FG	FG
xv)	Water/steam resistance	FG	FG	G	F	FG	F	G/P <sup>3)</sup>	P	G
xvi)	Flame resistance	P	P	P	G	P	G	E <sup>7)</sup>	P	G

Service temperature range (°C)    -54 to +121    -50 to +60    -54 to +107    -40 to +120    -60 to +60    -93 to +232    -40 to +40    -20 to +80    -20 to +140

Code :

P = Poor  
F = Fair  
G = Good  
E = Excellent

Source :

1 Swastik Rubber Products, Pune  
2 Calico Chemicals, Bombay

NOTE — The above properties serve only as a guide and are applicable for only properly compounded and vulcanized rubber.

1) See IS 5188 : 1985 and IS 5189 : 1985.

2) See IS 4588 : 1986.

3) Specification limits for these characteristics have been stipulated in IS 9766 : 1981.

4) Not recommended above 50°C continuous works.

5) When specifically compounded.

6) May be good when so compounded.

7) When specially compounded.

## ANNEX D

( Clause 3.3 )

LIST OF INDIAN STANDARDS SPECIFICATIONS ON COATED/TREATED FABRICS  
ALONG WITH NATURE OF SUBSTRATE COATING, BASIC PARAMETERS AND  
SPECIFIC END-USES

SI No.	IS No.	Title	Substrate	Coating	Mass Per Unit Area (g/m <sup>2</sup> )	End-Uses
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	IS 1001 : 1956	Fuel pump diaphragm fabrics synthetic rubber proofed varnish proofed	Cotton Silk	Synthetic rubber (oil resistance type) bodied drying oils or synthetic or natural resins or a mixture of these	Synthetic rubber (cotton)—850±17 proofed Varnish—170±17 proofed (silk) Type 1 Varnish—290±17 proofed (cotton) Type 2	Fuel pump diaphragm for motor vehicles
ii)	IS 1259 : 1984	Vinyl coated fabrics	Cotton Rayon Other synthetic fibre or their blends	Vinyl chloride polymer or copolymer (Coating on one side only)	Grade 1 — 680 Grade 2 — 460 Grade 3 — 385 Grade 4 — 320 Grade 5 — 270 Grade 6 — 235	Upholstery, side panelling, wall lining, automobile head lining, book binding, etc
iii)	IS 2089 : 1977	Common proofed canvas/duck and paulins ( tarpaulins )	Cotton	Paraffin wax consisting of a suitable pigment and aluminium stearate	Not prescribed	Canvas Duck Tarpaulins
iv)	IS 2789 : 1982	Special proofed paulins ( tarpaulins )	Cotton	Not mentioned	Not prescribed	Special proofed tarpaulins
v)	IS 3322 (Part 1): 1987	Water-resistant clothing: Part 1 PVC-coated fabrics	Cotton Nylon	One or both sides coating with vinyl chloride or copolymer, the major constituent of which vinyl chloride	Type LC 270 HC 380 LN 270 MN 380 HN 380	Navy and merchant shipping for water resistant clothing, light weight coats, jackets, trousers, legging, industrial water-resistance clothing
vi)	IS 3768 : 1966	PVC-ventilation tubing ( flexible ducting )	Jute Hessian	PVC	760	Auxiliary ventilation in mines
vii)	IS 4355 : 1977	Fire resistant brattice cloth	Jute Cotton or any other suitable fabric	Not mentioned	Not mentioned	Coursing air around the underground working faces in mines
viii)	IS 4810 : 1968	Fumigation sheets and covers, rubberized	Cotton	Vulcanized rubber composition prepared from high grade natural and/or synthetic rubber	625	Fumigation cover
ix)	IS 5915 : 1970	Single texture rubberized waterproof fabrics	Cotton Viscose staple	One or both sides with natural rubber or suitable vulcanizable synthetic rubber or a combination thereof	250 to 800	Raincoats water-proof shoes, gloves, caps and water proof covering for infant and sick beds

## ANNEX D ( concluded )

**LIST OF INDIAN STANDARDS SPECIFICATIONS ON COATED/TREATED FABRICS  
ALONG WITH NATURE OF SUBSTRATE COATING, BASIC PARAMETERS AND  
SPECIFIC END-USES**

Sl No.	IS No.	Title	Substrate	Coating	Mass Per Units Area (g/m <sup>2</sup> )	End-Uses
(1)	(2)	(3)	(4)	(5)	(6)	(7)
x)	IS 6110 : 1983	Double-texture rubberized waterproof fabrics	Cotton Viscose staple	Natural rubber or suitable vulcanizable synthetic rubber or a combination thereof	3 75 to 625	Ground sheet water proof garments, travelling bags, holdalls
xi)	IS 8698 : 1984	Expanded vinyl coated fabrics	Cotton Rayon other synthetic fibre or their blends	PVC polymer/ copolymer	450 to 800	Heavy duty luggage upholstery
xii)	IS 8699 : 1977	PVC coated fabrics for footwear industry	Not mentioned	PVC	Expanded PVC coated fabrics 550 to 1 250 Non-expanded PVC coated fabrics 400 to 900	Footwear industry

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